

Appl. No.10/762,599

Paper dated: July 6, 2006 July 6, 2006

Reply to Office Action dated April 6, 2006

REMARKS

Reconsideration of the above-identified application in view of the foregoing amendments and following remarks is respectfully requested.

A. **Status of the Claims and Explanation of Amendments**

Claims 1-11 are pending, among which 1-8, and 10-11 are rejected and claim 9 is objected. Applicant hereby amends the claims and specification, details of which are explained as follows. By this paper, claims 2, 3, 8, 10 and 11 are cancelled without prejudice or disclaimer. Claims 12 and 13 are added. No new matter will be added by the entry of this amendment.

Regarding element 58 through 64 indicated in the specification but not shown in the corresponding drawing., Applicant hereby follows the examiner's recommendation and re-numbers the elements by reference numerals 18 through 24, which are originally illustrated in Fig. 16. (Office Action, pp. 2, also see rewritten paragraph beginning at page 30, line 16 in Amendment to the Specification).

Regarding reference numeral 31, which is referred to mark elements and is intended to encompass mark element 31A in Fig. 4A and 31B in Fig. 5A, Applicant hereby takes the examiner's suggestion and adds a statement to recite that "[a] mark element 31 is used as generic term of the mark element 31A and mark element 31B". (See rewritten paragraph beginning at page 11, line 17 in Amendment to the Specification).

Regarding claim 9, which is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim, Applicant hereby amends the preamble of claim 9 to recite "[a]n exposure apparatus for exposing an object to a pattern", thus further limiting claim 9 to read on an exposure apparatus with respect to claim 7, which is directed to a detecting apparatus. Support for the amendment can be

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found through the application, for example, in Fig. 2, where an exposure apparatus including a “projection optical system”, a “wafer stage that positions the wafer” and an “alignment optical system ... that measures a position of the alignment mark on the wafer” is disclosed.

(Specification, pp. 10, lines 10-20).

Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, because the term “randomness” in claim 1 is a relative term that renders the claim indefinite. Applicant hereby amends claim 1 and changes “randomness” with “reproducibility of interval of the detected alignment mark” in claim 1.

Claims 12 and 13 are added to recite a method and an apparatus for inspecting an overlay state between a first mark and a second mark and to replace claims 10 and 11.

Accordingly, no new matter will be added by the amendment. The entry is respectfully requested.

- B. Claims 1-2 and 10-11 are patentably distinct from U.S. Patent No. 5,805,866 to Magome et al. (“Magome”) because Magome fails to teach or disclose the determination of the number of marks (or the number of shot areas) based on the reproducibility of the element interval.

Claims 1-2 and 10-11 have been rejected under 35 U.S.C. 102(b) as being allegedly anticipated by Magome. The rejections are respectfully traversed. As explained more fully below, the requirements for such rejections are not met. In particular, Magome fails to

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teach or disclose the determination of the number of marks based on the reproducibility of the element interval as recited in claim 1.

Applicant's claim 1 recites:

A method of detecting disposition of a plurality of shot areas on an object, the plurality of shot areas being exposed to a pattern in accordance with the detected disposition, said method comprising:

a first detection step of detecting an alignment mark in the plurality of shot areas, the alignment mark including elements that have an interval therebetween;

an evaluation step of evaluating reproducibility of the interval of the detected alignment mark;

a determination step of determining a number of alignment marks in the plurality of shot areas based on the evaluated reproducibility; and

a second detection step of detecting the disposition of the plurality of shot areas by detecting a plurality of alignment marks in the plurality of shot areas, a number of the plurality of alignment marks having been determined by said determination step.

Magome is directed to an alignment method for achieving accurate alignment by accurately eliminating an isolated area with a large nonlinear component of an alignment error from sample areas. According to Magome, the disclosed method comprises: a first step of measuring coordinate positions of N sample areas selected in advance from a plurality of areas to be processed; a second step of calculating nonlinear components of deviation amounts of the coordinate positions of N sample areas from corresponding design positions on the basis of the coordinate positions and calculating a variation of the N nonlinear components; a third step of

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calculating nonlinear components of deviation amounts of the coordinate positions; a fourth step of selecting the sample areas used in the third step for calculating depending on the variation; and a fifth step of calculating the arrangement coordinate values by executing statistical processing of the coordinate positions. (Column 1, line 64 to Column 2, line 26).

To anticipate a claim, the reference must teach each and every element of the claim. MPEP 2131. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference."

Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631 (Fed. Cir. 1987). Claim 1 is patentably distinct from Magome because determination step recited in claim 1, a step of "[d]etermining a number of alignment marks in the plurality of shot areas based on the evaluated reproducibility", is not taught or disclosed in Magome.

Therefore, claim 1 is respectfully asserted patentably distinct from Magome.

Applicants cancels claims 2, 10 and 11 without prejudice or disclaimer.

C. Claim 3 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Magome in view of U.S. Patent No. 4,070,117 to Johannsmeier ("Johannsmeier").

Applicant hereby cancels claim 3 without prejudice or disclaimer.

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- D. Claim 6 shall not be rejected under 35 U.S.C. 103(a) as being unpatentable over Magome in view of U.S. Patent No. 6,411,386 to Nishi ("Nishi") because none of the references, whether taken alone or in combination, teaches, discloses or suggests a "determination step of determining a number of alignment marks in the plurality of shot areas based on the evaluated reproducibility", which is incorporated in claim 6.

Claim 6 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Magome in view of Nishi. Applicant hereby respectfully traverses the rejection detailed as follows.

Nishi is directed to an alignment apparatus and method for successively bringing a bringing a plurality of shot regions to be processed on a substrate into alignment with a predetermined reference position. According to Nishi, the method comprises selecting k pieces of a preparatory measurement objective region from among the m pieces of measurement objective region; determining the array coordinates of the shot regions; successively bringing the k pieces of preparatory measurement objective region into a predetermined measuring area; processing the results of the measurement of the coordinate positions of the k pieces to calculate parts of the linear errors; updating the measured coordinate positions according to the calculation results; successively bringing (m-k) pieces of the measurement objective region into the measuring area, and performing a statistical computation on the updated coordinate position and computing the linear error of the actual coordinates of each of the shot region. (Column 3, line 20-46).

However, Nishi is entirely silent in teaching, disclosing or suggesting "a determination step of determining a number of alignment marks in the plurality of shot areas

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based on the evaluated reproducibility" incorporated in claim 6. According to Nishi, the total number for sample shot is pre-determined (A1-A2 and B1-B8) in view of the detailed description. (Fig. 6a and Fig. 8). Therefore, since Nishi has no such a determination step of determining a number of sample shot based on the evaluation result from the preceding step, Nishi can not teach, disclose or suggest a determination step to determine a number of alignment marks based on the evaluated reproducibility.

Accordingly, the limitation of "a determination step" incorporated in claim 6 is not taught, disclosed or suggested in either Magome or Nishi, whether taken alone or in combination. The prima facie case of obviousness has not been successfully established by the examiner. Applicant hereby respectfully requests the rejection on claim 6 be withdrawn.

E. Claim 7 shall not be rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,859,707 to Nakagawa ("Nakagawa") in view of Nishi because none of the references, whether taken alone or in combination, teaches, discloses or suggests "a processor ... to determine a number of alignment marks in the plurality of shot areas based on the evaluated reproducibility..."

Claim 7 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagawa in view of Nishi. Applicant respectfully traverses the rejection based on the following.

Claim 7, as amended, recites:

An apparatus for detecting disposition of a plurality of shot areas on an object, the plurality of shot areas being exposed to a pattern in accordance with the detected disposition, said apparatus comprising:

a detector configured to detect alignment mark in the plurality of shot areas, the alignment mark including elements that have an interval

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therebetween;

a processor configured to evaluate reproducibility of the interval of the detected alignment mark, to determine a number of alignment marks in the plurality of shot areas based on the evaluated reproducibility, to cause said detector to detect the determined number of alignment marks in the plurality of shot areas, and to detect the disposition of the plurality of shot areas based on the detection of the determined number of alignment marks.

According to the examiner, Nakagawa discloses an apparatus for detecting dispositions of exposure shot areas, comprising a first detector, a second detector and a processor “[o]perable to receive the first and second electrical signals and determine from the signals the position of the position-detection mark...” (Column 3, lines 45-49).

However, neither Nakagawa nor Nishi, whether taken alone or in combination, teaches, discloses or suggests “a processor ... to determine a number of alignment marks in the plurality of shot areas based on the evaluated reproducibility...”. Therefore, the prima facie case of obviousness has not successfully established by the examiner. Applicant hereby respectfully requests the rejection be withdrawn.

- F. Claims 8 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagawa in view of Nishi further in view of U.S. Patent No. 5,740,065 to Jang et al. (“Jang”).

Applicant hereby cancels claim 8 without prejudice or disclaimer to overcome the rejection.

- G. Allowable Subject Matter in claims 4 and 5

The examiner indicated that claims 4 and 5 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, to include all of the

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limitations of the base claim and any intervening claims. As Applicant explains above, claims 1-6, as amended, satisfy the requirement set forth in 35 U.S.C. 112, second paragraph. Since claim 1 is asserted patentably distinct from Magome, for at least the same reasons, claims 4 and 5 are hereby respectfully asserted in condition for allowance.

Applicant has chosen in the interest of expediting prosecution of this patent application to distinguish the cited documents from the pending claims as set forth above. These statements should not be regarded in any way as admissions that the cited documents are, in fact, prior art.

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CONCLUSION

For the above-stated reasons, this application is respectfully asserted to be in condition for allowance. An early and favorable examination on the merits is requested. In the event that a telephone conference would facilitate the examination of this application in any way, the Examiner is invited to contact the undersigned at the number provided.

THE COMMISSIONER IS HEREBY AUTHORIZED TO CHARGE ANY ADDITIONAL FEES WHICH MAY BE REQUIRED FOR THE TIMELY CONSIDERATION OF THIS AMENDMENT UNDER 37 C.F.R. §§ 1.16 AND 1.17, OR CREDIT ANY OVERPAYMENT TO DEPOSIT ACCOUNT NO. 13-4500, ORDER NO. 1232-5256.

Respectfully submitted,
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Dated: July 6, 2006

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CONCLUSION

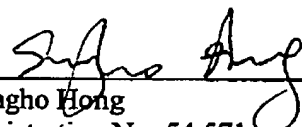
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